The Michigan Antique Radio Chronicle

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A QUARTERLY WRITTEN FORUM OF THE MICHIGAN ANTIQUE RADIO CLUB

VOLUME 33 | Winter 2018 | NUMBER 4

Rachel Rotay shows her vintage RCA 66X1.

See page 2 for the story behind this photo.

THE MICHIGAN ANTIQUE RADIO CLUB

The Michigan Antique Radio Club was founded October 19, 1985 at the Dillon Inn in Lansing, Michigan. Present at this historical meeting to found MARC were Jim and Brenda Clark, Larry Anderson, Karl Rommel, Mike Male, Dick Perry and John Kent. The purpose of the organization is to preserve the history and enhance the knowledge of radio, television, and related disciplines, with special emphasis on contributions originating in the state of Michigan. Dues for membership in M.A.R.C. are $25.00 annually (US funds) and payable in January. Officers of M.A.R.C. welcome your membership, your questions and your personal contributions to enhance the service value, growth and activities of the organization. Terms of office for Board members expire concurrently with the summer EXTRAVAGANZA meet held in Kalamazoo, Michigan. Send Correspondence to MARC, 311 Wordsworth St., Ferndale, MI 48220. E-mail: president@michiganantiqueradio.org. **Visit our Web site at** www.michiganantiqueradio.org.

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THE MICHIGAN ANTIQUE RADIO CHRONICLE is a forum of the Michigan Antique Radio Club. It is published four times a year. Annual subscription fees and one classified advertisement per issue are included in paid membership dues. Articles of interest to collectors of items pertaining to vintage radio and television technology and communications are welcome. Reprinting, in any form, of individually copyrighted material published in this newsletter requires the permission of the author. If not cited with a "©", articles may be reprinted without specific permission but should include the name of the original author and publication. *THE MICHIGAN ANTIQUE RADIO CHRONICLE* is published in Brooklyn, Michigan. Circulation is dependent upon membership and exchanges. Currently, it approximates 600 copies. Articles and advertisements may be addressed to the Editor.

Cover Photo

Rachel is the daughter of Bob Rotay, a childhood friend of MARC Trustee Bryan Wilemon. Rachel has a strong interest in vintage music on phonograph records from the turn of the last century through the 60's and 70's, as well as vintage clothing. She is also an accomplished singer, song writer and play actor, all at the age of 16.

For her 16th birthday, Bryan gave her this RCA model 66X1 radio from about 1946. The photo shows her dressed and posing in a style that RCA might have used in an ad from that period.

We thank Rachel, her parents Bob and Susan, and Bryan for sharing this photo.

Perspectives

Another year comes to a close, and another Winter VEE is nearly here. We hope to see you all at the Costick Center in Farmington Hills, MI on January 26, 2019. We'll have the usual fun- two rooms full of great sellers and deals, two silent auctions, our end-of-show bargain auction, plus a presentation. If you haven't already marked your calendars, do it now! We had a full house last year, with over 800 buyers through the door, and are aiming to repeat that showing this time, too.

We've been having a lot of discussions during our board meetings about how to improve the shows. We're taking into account both the boring real-world issues of expense and bang for our buck as well as your ideas and feedback, where possible, to make this the kind of show you want. For Extravaganza '19 we're changing up the room configuration a bit. The main flea market space won't change, but we're moving the auction and other activities to Expo North, which is about half the size of Expo South. We're hoping that it makes for a cozier and more efficient use of space as well as a savings for the club. None of the programs will be affected by the move- we're still planning on our live auction, two silent auctions, donation auction, presentations and hopefully another fun event / publicity stunt like the Hey Jude World Record Record Playing event that was such a hit last summer. If any of you have an idea for an event, stunt, or other fun activity you think we could pull off next summer, please be sure and get in touch and let us know.

We're also negotiating with the Kalamazoo Expo Center to allow outdoor set-up for those dealers who would prefer that option. We'd be trying to locate interested sellers as close to the doors as possible to allow buyer traffic to flow through both areas to give maximum exposure. Stay tuned for more on this. It's not a done deal and there are rules and regulations that must be adhered to, but we're working on it.

As of press time, we're still looking for a membership secretary! If you or someone you know has decent organizational skills, minimal computer savvy, and a burning desire to help the club, please let us know and we can describe the duties and responsibilities of the office. Any help you could give us by filling this role or pointing us to someone who can would be greatly appreciated.

For more info as it happens, please be sure to check out our website. You can reach the site at www.thevee.org or www.michiganantiqueradio.org.

Here's hoping your holiday seasons are happy and healthy. Load up on the goodies, rest up, and we'll see you all in late January in Farmington Hills!

Jeff

EXTRAVAGANZA '19 will be held July 18—20, 2019 in Kalamazoo.
Note that this is a week later than previous years.

MARC Needs You!

Your club is looking for a new Membership Secretary. This is an illustrious position on the MARC Board with wonderful benefits, including unlimited vacation (except for club duties).

NOTES FROM THE SERVICE SHOP

No. 104

by John Reinicke

FM Stereo and Amplifier Adjustments

© 2018 by John Reinicke

Betty's robust coffee was doing a great job of clearing the morning fog. I had arrived well after dark the night before and was still working on 'awake'. I was visiting with Ken and Betty in the back office of their antique shop in Centerburg and we were all exchanging family gossip and tales over coffee, Danish rolls and bagels. After our initial exchange it was Ken that observed; "I'll bet you are planning to visit your friend Art first thing this morning before your usual trip to the attic."

I smiled and responded, "You are so right! What made you think of that?"

Ken gave me a 'oh COME ON' sort of look. "It is cold this morning and I expected you would want to let the sun warm things up to the point you wouldn't have to sit in your coat, hat and gloves."

I winked, nodded in quiet acquiescence and changed the subject. "The last time I was here, you were just opening your annex next door. How is that working out?"

Both Ken and Betty rolled their eyes but it was Ken that responded first. "Well - (Jack Benny with the appropriate pause) from a business standpoint I would have to say it has gone even better than we expected."

"Do I detect a 'but' in your response?" I responded.

They both smiled with a nod. It was Betty who answered. "Yes, there is a 'but'. We have gotten so busy RUNNING the business, that we don't have time to DO the business." I nodded and waved my hand for her to continue. "We now have so much walk in traffic when the tour busses pull into town that we have the need for a staff. In the past it was just the two of us and then we hired Jane to help me here with the showroom and Ken hired Bob to help at the warehouse south of town. Now we have three more full time employees and a whole bunch of part timers. The good thing for us is that we have the college, and in our experience college students make good part time employees since their schedules can be somewhat flexible and they can use the spending money. As I said, it is working really quite well, but all of this means we are busy with things like pay-

roll and schedules and we just don't have all the time we would like to do our 'picking'. That is even more frustrating because we need a steady supply of things to sell in the annex."

I gave them a sympathetic look. "So how DO you take care of keeping up your stock?"

Betty continued, "Well, we got lucky. We found two college women who are quite motivated and clever. And to top it off, both Clare and Lyn are quite charming, persuasive and willing to actually talk on the phone. They are unusually good at researching potential sources of the things we sell. They supply us with leads to sales and auctions and we have even gone out on a limb and let them off on their own, with a budget of course. Last weekend, between me, Ken and the two of them, we managed to cover three auctions in two states. And the best part is that they think of things that we hadn't in the past."

"You guys are pretty darn good at leads! What could they think of that you hadn't?"

They both smiled as Betty continued; "Clare has been keeping an eye on commercial real estate listings – mostly online. She looks for old buildings that are listed with low rental rates for large spaces. Frequently previous tenants will move out and leave stuff behind. Clare is really quite good at persuading agents to tell her what has been left behind. Usually the stuff is just junk but every once in a while she hits gold. Two weeks ago, she and Lyn took off in our van for Akron to check out an old warehouse and they came back with some really interesting old office furniture. The best, however, was two old 10-drawer plan files that they picked up for 20 bucks each. The agent just wanted them out and didn't care what might be in them. He was only too happy to help them load the van."

"So what was in those drawers?"

Betty beamed. "They were full of literally hundreds of Forbes Lithographs. Those plan files must have always been in a dry location because the lithographs were as nice as new and the original colors were still vibrant. "

I gave Betty a quizzical look. "What is special about Forbes Lithographs? I didn't think lithographs were all that exciting."

"Forbes Litho Manufacturing Company was located in Boston, was founded by Williams H. Forbes and had offices in New York, Chicago and as far away as London. They were known for lithography, embossing, type and block printing, plate printing, photography and photolithography. These Forbes were all printed in the 20's and include a whole series of famous Americans. Washington and Lincoln are always good and most people also like Teddy Roosevelt, Martha Washington, Ben Franklin, Thomas Jefferson, even Alexander Hamilton and Sitting Bull. We have been putting these in frames with nice matting and reflection free glass and sell them in the annex. A Washington – Lincoln pair fetches 300 bucks and the rest, individually will bring north of a C note. The best part is that we can meter them out over the next few years. Not exactly a fortune, but well worth the effort and we can continue to offer special items for sale."

Ken stepped in. "The last time you were here we were just getting into the annex. Would you like a tour before we open for the day?" I grinned and nod-

ded enthusiastically. "Well, we had better get going because there are two busses due in this morning and one this afternoon. Once they get here the whole town will be hopping."

We slipped out the back and into the back of the annex. As we walked through Ken introduced me to the staff as they were dusting, arranging things on shelves and generally getting ready for the day. I was impressed by how nicely things were displayed and lighted. I even spotted the Lincoln – Washington pair of lithographs nicely overhead lit in their reproduction period frames. I commented that things were so well displayed I felt the urge to buy something and Ken responded with a big grin, "That my dear sir, is exactly the desired response!"

As they opened for the day, I bid them good-by and went out the front door to head for the few blocks walk to Art's shop. As I turned the corner, I looked back and could see a surprising number of potential customers arriving for their morning in Centerburg. I could also see a line forming at the coffee shop.

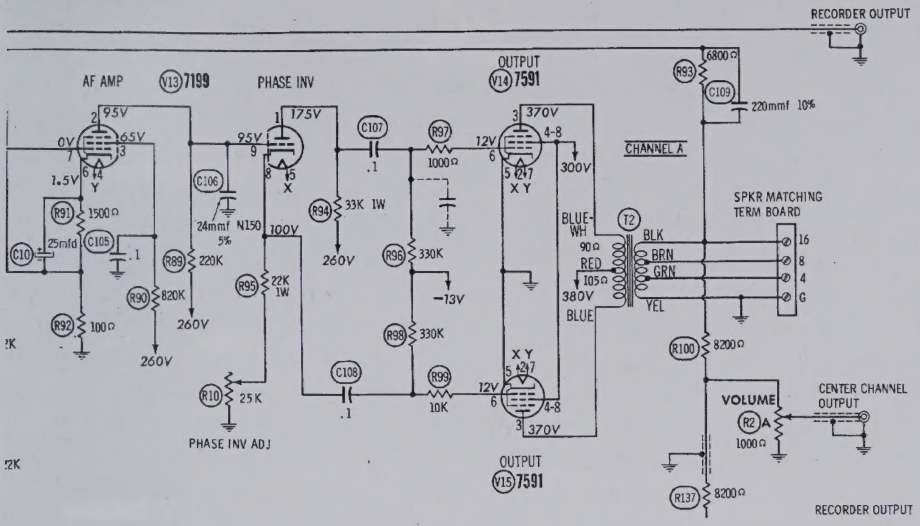
The walk to Art's shop was a bit more brisk than I expected and I paused for less than my usual time to enjoy the display in the front window. This time the display included a nice Zenith console next to one of those wonderful Majestic deco consoles – just the thing to catch the eye of any tourist that might happen by. As I opened the front door, the bell on the door caused Art to look up. Without saying a word, he smiled and pointed to the coat rack and the coffee pot. I took the cue and hung up my coat and grabbed coffee cup. "I approve," I said as I noticed that it was an old 'Michigan Antique Radio Club' cup with the old red logo on a white cup.

"Thought you would like that." Art responded.

I walked over to the bench, pulled up a stool and sat down. From the wisp of steam, I could tell that Art had just filled his cup. A local FM station was playing in the background. In the next few minutes, we traded family gossip and photos on our phones. We both agreed that Ken and Betty had done a great job with their shop and Art observed that all of the shops in town had 'upped their game' with the influx of tourists. He noted that there was even an upscale Bistro in addition to a new Brew Pub just off the square. "Did Betty happen to mention that college student, Claire, happens to be the great grand niece of Clem's long-time assistant, Darcy?" Art asked. I responded with a no but had to admit that the fact was certainly interesting. "Yep, she stopped in to introduce herself shortly after I opened a while back. She was in high school at the time and was already disarmingly friendly. No wonder she does so well for them."

As I looked around, I noticed the source of the music. "Isn't that the Fisher 800 you were working on the last time I stopped by?"

Art nodded, "Indeed it is. I told you at the time it could be a 'daily driver' and it does improve the ambience in the shop – at least until I decide to sell it. You know, John, the high power Fisher receivers include an adjustment that is not mentioned in the **Sams**. All of them, the 500 B and C and, of course, the 800 and 600 variants, have it and yet it is not mentioned in Sam's."



The Fisher 800 audio output circuit.

I gave Art a quizzical look and indicated he should continue. As Art warmed to the subject, I could almost see Clem settling in for a 'toolbox roundtable'.

"Designers of high quality, high power, tube type amplifiers have always known that for best performance, adjustments have to be included to account for the fact no two output tubes are exactly the same. A number of these designs would include some means of balancing plate current – usually by adjusting grid bias. A low resistance-metering resistor would be in the cathode circuit and the really fancy ones would have a front panel meter that could be switched from one to the other as you made the adjustment. Others included closed circuit phone jacks that would let the mechanic plug in a test ammeter. These adjustments are labeled DC or static balance.

"In addition to plate current, good designs will take into account that no two tubes will have exactly the same gain. To take this into account, there will be some means to adjust the AC signal going to the grids. Some called it AC or dynamic balance.

"The Fisher engineers decided that with reasonably matched tubes, they didn't need to worry about the DC balance but they did include a dynamic balance adjustment. It appears as a 'phase inverter adjustment' on the schematic. The pot is located on the bottom and is not accessible without removing the bottom cover. The **Sams** makes no mention of how to adjust it and the actual Fisher manual, if it says anything at all, will say 'factory setting, do not adjust.'

"Now that was all fine and good back in the day. But all of these really nice receivers, and Fisher amplifiers as well, are old enough to be eligible for AARP and I can't imagine that in the past five or six decades that someone hasn't given the adjustment a tweek. Plus the fact

this circuit uses carbon composition resistors and we both know that not all of those have been exactly stable in value. So I was confronted with an adjustment that I knew likely would require attention and no indication of how to make said adjustment."

I nodded in agreement. "So what did you come up with?"

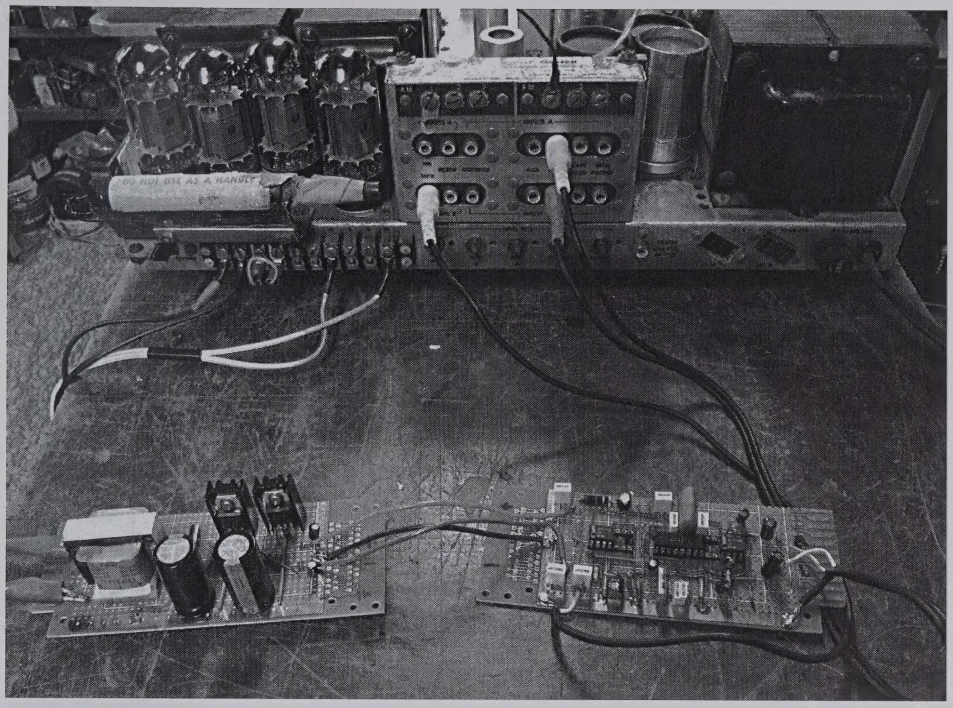
Art responded with a serious look. "Well I thought about it for a while and came up with four ways to make the adjustment. I tried each when I was testing the amplifier and I found that any of them would work reasonably well. How one might make the adjustment depends on what test equipment you might have on hand. First, let me dig up a schematic." Art walked across the shop to retrieve a **Sams** and spread it out on the bench. "This is the schematic for that 800." Art pointed at the receiver. "As you can see, the plate resistor for the phase inverter is a fixed 33K Ohm, R94. The cathode resistor is 22K Ohm, R95, in series with the adjustment, a 25K pot, R10. Since the plate current must pass through both the plate and cathode resistor equally, by adjusting the ratio of the plate and cathode resistance, one can adjust the ratio of the drive Voltages going to the output tubes.

"The first thing to do was to label the two pots with a sharpie as L and R for left and right so I wouldn't cross adjustments. So for my four methods, in the order of increasing complication ---"

Art paused to gather his thoughts. "The first method is quite simple. First, use your Ohmmeter to measure the resistance of the plate resistor, R94. Of course it should measure reasonably close to 33K. Obviously if it doesn't, replacement is in order. Make careful note of the reading. Next measure the resistance of the series combination of cathode resistor R95 and the adjustment pot. This would be from ground to pin 8 of the 7199. Adjust the pot such that the reading is as close as possible to your first reading. This way, the plate and cathode resistance will be exactly the same and the two output tubes will receive the same grid input Voltage. As long as the two output tubes are fairly well matched, this will give a satisfactory result.

" The second method requires additional test equipment. For this use an audio signal generator, set to around one KiloHertz. Connect the outputs of the amplifier to dummy load resistors rather than speakers. For this I have a pair of 8 ohm, 250-Watt resistors that I acquired years ago. Connect the signal generator to the aux input of the amplifier and adjust the amplifier volume for a nominal output. Use your oscilloscope to measure the AC grid drive at pin 6 on each of the 7591s. Set the pot to make the readings identical at both grids. Alternatively, measure the plate AC voltage at pin 3 and make that reading identical for both tubes. I would be very careful about measuring plate Voltage, however, because the peak Voltage could be well north of 500 Volts and that might be too much for your oscilloscope.

"The third method is actually somewhat easier than the second. Connect the oscilloscope across the output dummy load resistor. As before, use an audio generator set to around one KHz connected to the aux input. Adjust the amplifier volume control for just maximum output. Maximum output is reached when the sine wave displayed on the



Art's FM stereo demultiplexer connected to the Fisher 800

'scope just starts to clip – the top and bottom of the waveform will flatten. You will want to adjust the phase inverter pot for symmetrical clipping – equal flats on top and bottom.

"The fourth method is what I expect they used at the factory. For this I use my HP 333A distortion analyzer. This also requires the audio generator and dummy load resistors. With the amplifier set for nearly maximum output, adjust the phase inverter control for minimum distortion. As it turns out, this adjustment proved to be fairly 'tweeky'. I suppose if you were truly a perfectionist, you could make this adjustment with the amplifier set to your personal preferred listening level.

"In all of these adjustments, I do one channel at a time. For the power testing you really must use dummy load resistors because even the best speakers do not do well with continuous tones. At these power levels, your ears won't like continuous tones either. As for the results, since I have a distortion analyzer, I can speak with some certainty. The fourth method is of course the best. That said, the difference between the first and the fourth is less than 5 watts in maximum output or around one dB, at least for my sample amplifier, which had new, supposedly matched output tubes. If the output tubes are not so well matched, the third and forth methods would be the best. Since not everyone has a distortion analyzer, the third method is actually quite good. If all you have is a multimeter, the first method isn't all that bad and unless you like your music really

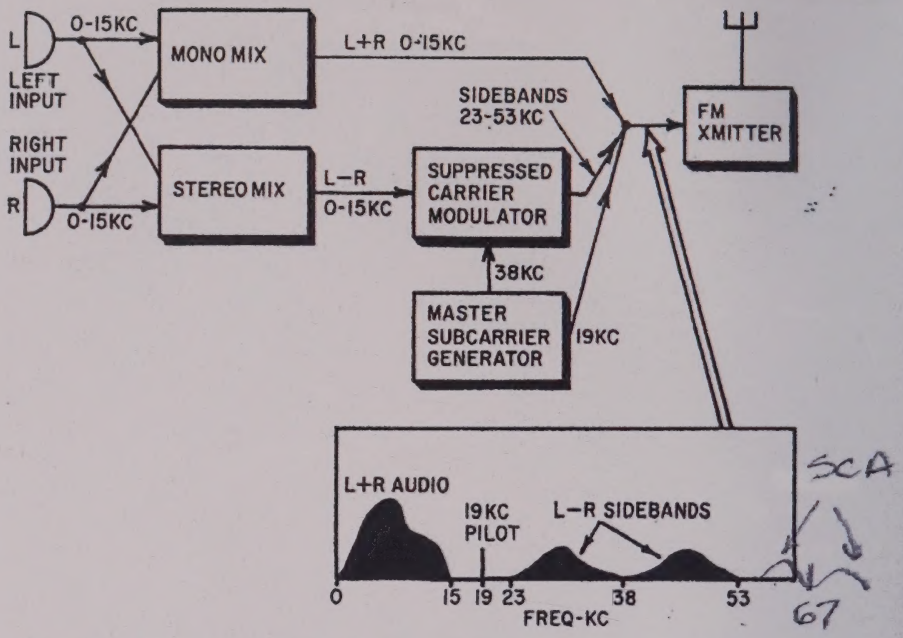


Fig. 2—Removing the subcarrier improves transmission quality; 19-kc pilot helps receiving equipment reinsert the subcarrier.

loud, you won't hear the difference. In fact, the first check would be a good preliminary setting even if you were doing method 3 or 4."

"That is a good tip." I responded with a bit of 'ah ha' moment that must have shown on my face. Art could see me mentally filing that away.

"As we have been talking I have noticed that your background music is in stereo." Art nodded with a smile to my comment as I continued. "I thought that 800 just predated FM stereo and I am quite sure your local station is not doing AM – FM stereo. Plus, I can see the AM eye is not on. Did you find a stereo adaptor?"

Art grinned. "I am glad you noticed! I didn't find one but I did make one." I could see Art was proud of his creation. I could also see that Art was in a mood to continue his 'toolbox roundtable' and I was only to happy to encourage him. He settled in with what turned out to be, for lack of a better term, a really great lecture.

"When he came up with Frequency Modulation, Armstrong realized, right from the beginning, that FM could be used for multiplex broadcasting. Because of the high frequencies involved and the

wide deviation, a large number of frequencies could be transmitted – a wider band of frequencies than just audio in the range of human hearing. He also realized that FM would, in effect, trade bandwidth for transmitter power in the effort to improve signal to noise performance. In FM broadcasting, the information is carried as a deviation of frequency away from the carrier frequency. For comparison, the information in an AM signal is conveyed as a change in the amplitude of the carrier. Because the information is contained as a deviation in frequency, a good FM receiver will include one or more stages of limiting in the IF. Thus the final IF stages will be operating in saturation and will not respond to changes in signal amplitude. Since noise tends to be spikes in amplitude, the receiver will simply not see the noise. In fact, the receiver will be 'captured' by the transmitter and won't see any other signal that is less than the received signal within the IF bandpass. Fancy FM receivers will publish a capture ratio that is expressed in dB. In the case of that Fisher 800, they claim it to be 1.5 dB, which means that an interfering signal that is only 1.5 dB less than the incoming signal simply will not be heard at all. You may have noticed this capture effect if you still listen to FM in your car. If you are driving out of the coverage area for a station and happen to be driving into the coverage area of a station on the same frequency, you will notice the receiver will hop to the new program and you won't hear the previous one at all. If you happen to be right on the edge of the coverage areas in a hilly part of the country you may notice the receiver hopping back and forth between programs which can be quite disconcerting.

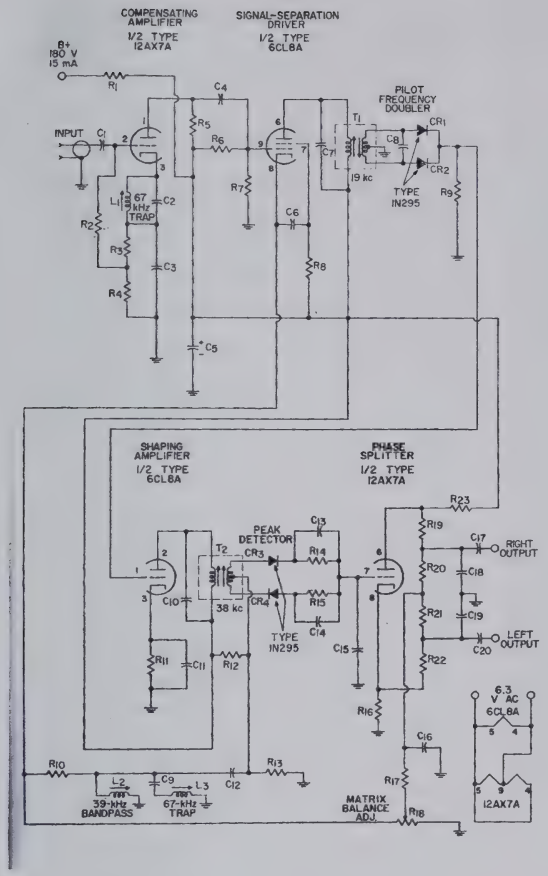
"The present standard for FM broadcasting calls for a maximum deviation of plus or minus 75 KHz from the assigned frequency. FM stations are assigned at 200 KHz intervals at odd assignments starting at 88.1 MHz. So the progression would be 88.1, 88.3, 88.5 and so forth. So if I am transmitting at 101.3 MHz, the instantaneous frequency will be between 101.225 and 101.375. As I mentioned, Armstrong realized that additional signals could be transmitted beyond audible frequencies. Thus you could transmit a full 20 Hz to 15 KHz high fidelity program and have additional signals at frequencies, say. in the range of 20 KHz to 80 KHz. Someone listening on a 'normal' receiver simply would not hear the higher frequencies. There is a trade off in transmitting additional information. The total sum of signals still has to fit into that plus or minus 75 KHz. So if you transmit a multiplex signal, the primary signal – the audio program level will be need to be reduced proportionally and because the level will be reduced, your coverage area will be reduced because of the signal to noise ratio at the fringe receivers.

"During WW II, stations in Armstrong's Yankee network were used to relay information as part of the civil defense program and would be rebroadcast by local AM stations. Even then, they would broadcast multiple programs. The first commercial use of a multiplex signal that I can think of is the SCA signals that became common in the 50's. In part, the incentive came from the fact FM broadcasting didn't have a lot of listeners in the late 40's and early 50's and the

broadcasters were looking for a source of revenue. The SCA or Subsidiary Communications Authorization signal was transmitted on a subscription basis and was used to provide that ubiquitous Muzak that we all remember in stores. This was the very first of 'elevator' music. The SCA signal would be usually be broadcast by a local FM station with a good coverage area. The SCA signal is transmitted as a subcarrier multiplex signal at 67 KHz. The SCA signal is itself an FM signal with a maximum deviation of plus or minus 15 KHz. The level of the main signal was reduced to allow for the SCA signal at a fairly low level. So a station broadcasting a SCA program would see a small reduction in its coverage area. Because the level of the SCA signal is low, the coverage area for SCA reception is smaller than the main coverage area. Since these stations were in big metro areas, the smaller area for SCA reception was not a problem.

"In late 1958, stereo records were introduced and that created a whole new market for stereo equipment. Stereo had been around for a while, of course, but stereo records made program material reasonable in price. By the late 50's AM stations, particularly powerful ones, were enjoying a huge audience by broadcasting the very new 'Rock and Roll'. With the advent of stereo, FM broadcasters could see the opportunity to differentiate themselves by offering stereo, and thus gain listeners. The very first stereo radio programs were broadcast as FM – AM. This was not exactly satisfactory. The first problem is that AM does not offer the wide frequency response of FM. The second problem was economic in that it required two powerful transmitters in the same area. A third problem was that a listener with a monophonic receiver would only hear one channel. The shortcomings of this method were recognized from the start, and manufacturers of FM tuners and receivers included a 'multiplex' output in anticipation of some sort of adaptor.

"In those days, the FCC had the budget and staff to take on involved technical analysis and would do extensive research in the interest of developing standards for broadcast signals. With the interest in stereo, literally dozens of proposals for multiplex stereo were submitted. Some such as the Halstead system were rejected because one channel would be on the main channel and one would be on the multiplex channel. Thus someone with a monophonic receiver would only hear one channel. The FCC decided on some very reasonable requirements for stereo broadcasting. The first was that any system must be compatible with existing monophonic receivers – that a listener with a monophonic receiver would hear the complete program. The second requirement was that the addition of an additional signal would not greatly reduce the coverage area of the broadcasting station. The third requirement was that the additional subcarrier would not preclude the broadcaster from offering the existing SCA service. The fourth requirement was that the multiplex decoder couldn't be unduly complex – it had to be economical to produce and not require involved adjustments. The fifth was that the system had to offer good channel separation over a wide frequency range and have low distortion. Of course, they also considered the usual technical issues associated with



A vacuum tube multiplex adapter

broadcasting such as co-channel and adjacent channel interference.

"After considerable analysis, the FCC reduced the list of candidates to five. Crosby, Calbest, Multiplex Development - Burton, EMI - Percival and GE - Zenith. The Calbest and Burton systems were eliminated because they did not offer good channel separation. The EMI system was eliminated because it required a complex receiver circuit and did not provide channel separation over the full audio frequency range. That left the Crosby and GE – Zenith systems. Both systems incorporated a sum and difference system for the left and right channels. The main channel would be L plus R and the subcarrier would be L minus R. Thus a mono receiver would hear the complete program and the stereo decoder could retrieve the L and R channels by summing and subtracting the main and subcarrier channels. (L+R) + (L-R) = 2L and (L+R) – (L-R) = -2R Keep in mind that the minus sign represents a simple 180 degree phase shift which is easy to deal with electronically.

"The Crosby system used a 50 KHz FM signal for the subcarrier and the GE – Zenith system uses AM for the subcarrier. The FCC eliminated the Crosby system for a few reasons. The Crosby system reduced the main carrier by 6 dB and thus greatly reduced the coverage area for the station. Plus the subcarrier would preclude the broadcaster from offering SCA service. At the time, there were 250 stations offering SCA service and of those, 81 were the only FM station in the market. That meant that in 81 markets the broadcaster would have to decide to keep his lucrative SCA business and forego a potential new stereo market or give up his SCA market. In addition, because the Crosby system used an FM subcarrier, the FCC decided it would be too simple to modify the circuit to intercept the SCA signal. It should be noted that the Crosby system did offer a slightly better signal to noise ratio for stereo reception.

(Continued on page 16)

My Atwater Kent Model 5

By David Snow

When I first starting collecting vintage radios, I was particularly interested in AK radios, especially the fancy cathedrals. My father, who was a radio/TV repairman, called me one day extremely excited. A gentleman just brought in a rare AK radio that I must see. I raced over to his shop and there it was, a completely original factory AK model 5 (complete with factory tags). Being interested in fancy cathedrals, I thought, why is he so excited about this radio constructed on a board? He had it on the bench playing and was crushed that I showed no interest what so ever.

As time moved along, I changed my thoughts about radios and focused on battery operated units. I soon realized that the model 5 was extremely rare. My father had passed away so I asked my mother to check Dad's service records to see if he had a name and address of the fellow that brought in that radio. My dad kept meticulous records however no record of this one. I later found out that my dad did this one for free so there were no records. I was crushed; there was a model 5 right here in Jackson and I had no way of finding it. However one day my mother received a phone call wanting to know if she knew anyone that could work on old radios. Of course she did and gave him my name.

The fellow called me and started talking about a radio my father had worked on and wondered if I could help him get it going. When he indicated that this particular radio required batteries, I thought, could this possibly be the long lost model 5? I asked, is this constructed on a board? When he said yes, I almost dropped the phone. As it turned out, he brought it to my house with the idea of making it play. When I saw the radio, I asked him "would you be interested in

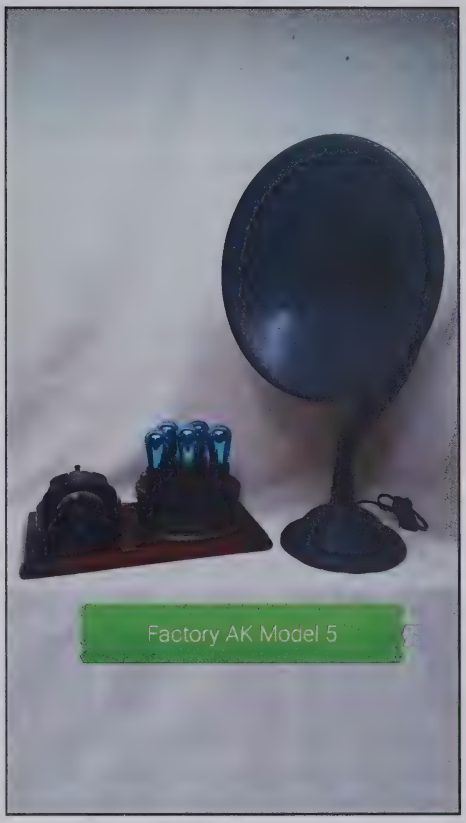
selling this radio?" He answer was "absolutely no" He wanted it to play and eventually would put it on display at "Radio Shack"

OK, what I decided to do was get the radio playing. He would need a power supply and a horn speaker. My thought was I will give him the power supply and horn for no charge with the understanding that sometime in the future, should he decide to sell the radio, he would give me a chance to buy it. I took the radio, power supply and horn to his house. I set everything up for him, including a long wire antenna. We had it playing on a local station with remarkable volume. He then asked me "what do I owe you" I gave him my proposal; no charge just let me know if you ever decide to sell it. Again, he no way would he ever sell it. OK, end of story.

About 3 days later he called me. He was thinking about the radio and the history behind how he found it while cleaning an attic and how my father had initially got it running. He felt that it really should belong in my collection. He then told me to figure out how much I could pay. He told me that he had done his homework and realized that this was a rare find.

Here was the problem, my wife and I recently built a new house and 6 months earlier I had lost my job with opportunities for future employment rather bleak. Somehow we came up with $1,000 knowing that we simply couldn't come up with any more. Even back then (30 years ago) the model 5 could bring $3,000.

I went back to his house and had a discussion with the fellow. Again, he reminded me that he knew this was



worth a lot. I explained my situation, that I really couldn't pay him the full value of it because of my employment situation. His response shocked me. "No way will I sell this radio for $1,000" I was crushed and thought this guy really has done his homework. He then said; "I'd like to get some new golf clubs and $100 will be just fine"

My model 5 is one of my prized possessions. Bottom line is, you never know how things will work out. Once I realized that there were no records on the model 5 repair (some 40 years ago), I basically gave up any hope of ever locating that radio. It is now part of my collection of Atwater Kent breadboards.

(The Shop, continued from page 13)

"This made the GE – Zenith system the winner that is used to the present. This system allowed a broadcaster to keep his SCA service and would only reduce the main carrier by 1 dB, which meant the coverage area would be only slightly reduced. Good stereo could be received in 75 percent of the coverage area and that was deemed sufficient since outside that area, you could still get a mono signal. So the resulting standard is as follows: The main channel, which is left plus right, covers 20 Hz to 15 KHz. The subcarrier, which is left minus right, is broadcast as double sideband, suppressed carrier AM at 38 KHz. Thus the subcarrier falls between 23 and 53 KHz, which does not interfere with the SCA signal at 67 KHz. Although a full carrier AM signal would make for a simple receiver the carrier signal would double the signal power requirement and carries no information. Eliminating the carrier would permit good stereo without reduction of the service area. However, to demodulate a sideband signal without distortion requires that the demodulator have a synchronous oscillator at the carrier frequency to recover the signal. To accommodate this, a pilot signal is transmitted at 19 KHz, which is exactly one half of the carrier frequency. This pilot is transmitted at a low level and 19 KHz falls halfway between 15 and 23 KHz and thus does not cause interference. As you can see, none of the choices made about frequencies were accidental – it is all quite clever and intentional."

Art took a moment to pull out a schematic and point as he continued his lecture.

"The real beauty of this system is that the multiplex signal could be recovered with low distortion, good channel separation and full frequency response with just two tubes and a couple of tuned circuits. In the receiver, the output of the ratio detector or discriminator, before de-emphasis, goes to an amplifier. The output of the amplifier goes three places. The first is another amp, usually a pentode stage, with a 19 KHz sharply tuned transformer, which recovers the pilot signal. This signal is connected to a diode frequency doubler, which provides the required 38 KHz for demodulation. A 38 KHz tuned transformer provides a proper sine wave and serves as part of a balanced mixer using a pair of diodes. A balanced mixer output is the sum and difference of the input frequencies. In this case the first input is the 38 KHz from the transformer and the second input comes from a 34 KHz bandpass filter from the input amplifier which is the transmitted double sideband signal. The output would be the difference, the recovered L – R signal. Technically, there is a signal of the sum frequency, but that is too high to matter or have effect. The recovered L – R signal is fed into a carefully balanced phase splitter and is combined with the L + R signal where the two are added and subtracted to recover the original Left and Right channels. The two channels then pass through their individual de-emphasis R-C network and become the outputs.

"Most stereo demodulators include a couple of 67 KHz traps to be sure if there is a SCA signal, that it does not cause problems with the stereo. By the way, 67 KHz traps were included in most high quality tuners starting in the mid

50's. Folks would tape record FM programs and if the tape recorder happened to have a record bias oscillator near 67 KHz the SCA signal would make weird beat tones appear on the recordings.

"The GE – Zenith system was approved by July of 1961 and stereo broadcasting was on its way. By the end of 1962 several stations were transmitting stereo. As we all know, FM stereo 'changed everything' and stereo record and equipment sales really took off."

Art paused and took a sip of his now lukewarm coffee. As he did, we both heard two people clapping. A couple of customers had slipped in early in the presentation and were quietly listening and enjoying the presentation. I could see that the taller of the two was staring at Art's Fisher receiver and appeared to be tech savvy. It was the tall guy that spoke up.

"I heard you say you had built a multiplex adaptor for that receiver, but I don't see it."

Art grinned, again happy to explain. "Look closely, it is behind. For my adaptor I didn't want to come up with those tuned circuits so I went solid state. You can still find good stocks of stereo demodulators on line. The only catch is that a solid-state unit has low input impedance and is expecting an input of around half a Volt. Tube stuff has an output of a couple of Volts at high impedance. To accommodate, I used an op amp to effect the shift in Voltage and impedance at the input and used a second dual op amp to get the outputs back up to 2 Volts."

The tall guy peered over the Fisher and smiled. "Looks pretty good to me."

Art continued his presentation with his audience of three. "If you are collectors, I think it would be fun to try to find some of the failed adaptors from the time. A few manufacturers decided to not wait and took a chance on selling adaptors. I think it would be fun to find a Calbert 8108 tuner or the Harman-Kardon Crosby system adaptor. Fisher also sold a Cosby system adaptor. I am sure there had to be prototypes that were presented to the FCC for testing for all of the various systems. I have no idea if any of these survive and if they do, they certainly won't work. But, golly wouldn't they be an interesting artifact?"

I couldn't resist commenting. "Art, you are a knowledgeable guy to be sure. How is it possible you remember this from 60 years ago?"

Art had a sly look as he responded. "Truth be told, I didn't. When I decided to do the multiplex adaptor I also decided to do a little history research. I can highly recommend the March 1959, July 1959 and July 1961 editions of "**Radio-Electronics**" magazine. These can be found pretty quickly on line and each has a rather interesting article on the subject at the time."

The four of us all agreed it was an interesting period over fresh cups of coffee.

Editor's Note: John will be supplying a follow up article with details on building a multiplex adapter that can be used with your vintage FM tuner.

Bret's Old Radios Video Review

By Steve Enzer

Last summer I received an email from Bret Menassa, advertising his DVD video collection on restoring antique radios. I was familiar with Bret, in that he used to publish an email newsletter about a decade ago. (Perhaps he still publishes it, but that is when I last saw one.) Anyway, I looked over the literature on the DVDs and was intrigued. The set includes instruction on both electronic repair and restoration of both wood and plastic cabinets. Plus, the five DVDs were on sale for $60 plus $7.50 shipping, which is $40 off the regular price.

The reason for my interest is that I haven't done a lot of radio restoration, though I plan to do a lot more since I'm about to retire. I have done some electrical repairs, but have stayed away from cabinet refinishing. Most of the sets in my collection have been purchased in good to excellent cosmetic condition. One time I bought a Zenith console with damaged veneer, but I sent it out to a friend who had a refinishing business.

I do have a few basket cases, both wood and plastic, waiting for attention. One of the saddest ones was actually my first antique radio, an Atwater Kent 185 tombstone, that an elderly relative gave me when I was about 12. The veneer was beautiful, and the set brought in a lot of stations with a long wire antenna. I had it in my room for many years, but at some point it migrated to the basement floor. During a major storm one year, the basement flooded and the radio got a good soaking. The veneer curled and glued joints separated. It is a mess, but I never had the heart to discard it. My refinisher friend took a look at it and just shook his head. But I figured maybe someday...

So I decided to spend the money and take a chance on Bret's Old Radios. After viewing all five disks, here are my impressions:

Volume 1 is titled *A Step-By-Step Guide to Old-Radio Repair*. This disk is an introductory lesson that takes you through the entire process of restoring an antique radio, in this case a 1936 Philco 640 tombstone. If you have never tackled a major radio repair project, this video provides an excellent overview of the process. It touches on radio theory, but not in great detail. Bret starts by disassembling the radio and cleaning the chassis. Then he gets into the chassis repair. The Philco 640 is not a simple radio and this set has some interesting problems. You get a good introduction to the troubleshooting process and techniques for replacing components. Next, the video moves on to the cabinet. This set has a lacquer finish with lots of wear and nicks, but no major damage to the wood. Bret shows his techniques for repairing the lacquer and matching the original color. He ends the video with information on where to get schematics and parts, mentioning vendors including our own Mark Oppat.

After viewing the first volume in the series, several things impressed me. The videos are of professional quality, filmed by an experienced cinematographer. These are not do-it-yourself videos typical of many You-Tube productions. Further, Bret's presentation techniques are excellent. He is entertaining, articulate, and proceeds at a comfortable pace so it is easy to take notes. Professionally, Bret teaches col-

lege-level psychology, and his classroom skills are apparent in these videos. Also, each video had a table of contents, so you can easily jump to a chapter to review a particular topic.

My one criticism is that he does not spend any time on soldering techniques, which are crucial to making successful repairs. So if you are new to soldering, be sure to look to some other sources on the proper tools and techniques.

The second video is titled *Intermediate to Advanced Theory & Troubleshooting*. The table of contents includes Tube Diagrams, Three Fundamental Principles, Power Supplies, Heater String Resistance, The Super Heterodyne, Diagrams and Schematics, Coils and Windings, and Alignment.

As I started watching this video, my first impression was that the technical explanations are overly simplistic. At this point I have to admit that I have an electrical engineering background and I am probably being a bit snobbish. In reality, you do not need an engineering, or even an electronic technician's background, to repair old radios. I know plenty of collectors without tech backgrounds who would run circles around me when it comes to troubleshooting technique, just because of the bench experience they have acquired.

Bret uses the All American Five as the primary example for his theory and troubleshooting discussions. This is a fairly generic circuit that was used in smaller AM table radios from about 1939 until transistors replaced tubes. Tubes changed as they became miniaturized, but the circuit principles remained the same.

As he goes through the theory behind each section of the circuit, Bret includes lots of good tips on troubleshooting and component replacement. He gives a good explanation of the super heterodyne process with block diagrams, before moving into actual circuit diagrams. Since these cheaper sets did not use power transformers, the very early ones would sometimes use resistance line cords to drop the line voltage before it is applied to the series string of tube heater elements. This design was dangerous, in that the line cords could overheat and cause fires. (They are often called "curtain burners".) The video shows how to replace these old line cords with internal voltage dropping components. Finally, there is a good demonstration of alignment techniques, with or without using a signal generator.

Overall, this second video contains much useful information that will help you get started in circuit repair. If you want to get deeper into radio circuits, I would recommend a good book on the subject. One of my personal favorites is *Old Time Radios! Restoration and Repair* by Joseph J. Carr. It came out in the early 90's but is still available from vendors like Amazon.

I do have one major criticism of these videos: There is no discussion (other than a written disclaimer) regarding the shock hazards inherent in radio servicing. The inexpensive sets used in the examples are particularly dangerous because they have no power transformer, and one side of the line cord is connected directly to the chassis. Depending on the orientation of the power line plug when it's connected to a socket, the chassis can be hot relative to ground. If you are touching the chassis with one hand and a grounded test instrument with the other, you can get a lethal shock. The only safe way to service these sets is by powering them with an isolation trans-

(Continued on page 23)

The Zenith 6S-254 Kit

By Edward Dupart

This is an interesting story of a radio that got passed around. All names are fictional, except mine of course, but the story is true.

Joe has a Zenith 6S-254 that he wanted restored, so he took it to Shmoe's radio shop. Shmoe had it for seven months and Joe wanted it back. Joe probably figured if he can't fix it in seven months he will never fix it, so he picked it up. Joe discovered that all the paper capacitors, mica capacitors and the electrolytics have been removed and the only parts given back to him were the mica capacitors. I'm sure Joe wasn't happy so he took it to Mike's to be fixed. Mike took a look at it and said, "No way!" but I do know John might try and put it back together. John took a look at it and said, "Sure, I'll take a look at it." John knowing I have been building radios since I was ten gave me a call and asked if I would take a look at it. We discussed it over the phone and it sounded like a Zenith 6S-229 and looking at the schematic, it looked like a straightforward six-tube radio. I then asked him if the coils, trimmer capacitors and the variable capacitor have been messed with and John said, "No." I told him I would look at it and I told him I would consider it a 1937 Zenith radio kit, partially put together.

Why would someone take all the capacitors out of a radio to be restored at the same time raises questions? I have actually run across bitter TV repairmen back in the 1960's doing such a thing because of a squabble with a customer, but I don't think that is the case with this radio. All of the components were carefully unsoldered with no detectable damage anywhere. Someone in a rage would just rip them out. I'm guessing he used a digital camera and took lots of pictures of the underneath of that chassis and figured he could put it all back together by using the pictures. I take lots of pictures for the same reason, but I still only change one or two capacitors at a time and I still write/draw a roadmap where the parts go. That way it reduces the chances of an error and I've been known to make a few. If the radio was working to begin with albeit poorly, I like to try out the radio after a capacitor or two have been changed, which reassures me that I didn't goof up. That's my take on why he chopped out all those capacitors. Maybe you have better idea and if so, let me know.

It was a blustery late November Saturday morning with winds up to 30 mph and the snow coming down in a horizontal direction. It was almost 70 the day before and the cold front coming through on Saturday morning was a nasty one. Fortunately the roads were still warm and the snow didn't accumulate on the roads, just on the grass and was only up to 3" in places, but mostly around one inch. I was running late and so I picked up a couple of sub sandwiches and finally got to John's about 11:15 and we ate lunch first while watching the snow come down horizontally. That wind was horrible.

After lunch I dove into the Zenith and inspected what was left of it and made sure the IF transformers, coils and trimmer capacitors were in place. If they had been missing I would have said, "No way!" I'm good, but I'm not stupid. Replacing all the capacitors didn't seem like a big deal to me as long as I have a sche-

matic. Unfortunately, I forgot my camera, because I really wanted to take a picture of the bottom of that chassis to show how empty it looked with about 75% of the parts missing, including a resistor or two. It sure looked bare.

Most radio collectors probably have a radio with a gutted chassis that they would like to put back together, so one of the reasons I'm writing this is to show the collector the logic I used in restoring this Zenith.

My first step is to get the power supply working. John had tested the tubes; at least it wasn't stripped of its tubes, and noticed it has a 5Y3 instead of the 5Y4 that originally came with the set. I checked the filament wiring and it had been wired for the 5Y3. The 5Y3 and the 5Y4 are almost identical with the 5Y3 being capable of handling another 40 ma of current and both tubes draw 2 amps of filament current. So I left the 5Y3 in place. The 5Y3 uses pins 2 and 8 for the filament and the 5Y4 uses pins 7 and 8 for the filament and that's the only wiring difference between the two tubes. I replaced the power cord and the filter capacitors and now it's time to try out the power supply. After plugging in the speaker and plugging in the power cord and turning it on, we found we had voltage and the field coil was good. With no load the B+ voltage was high, which is what I expected, but everything was running cool and the power transformer is good and all the filaments/heaters and pilot lights lit up. Onto the next stage.

Now it's time to wire up the two audio stages. Remember earlier I said it looked like a 6S-229? Well, I wired up the audio section like a 6S-229, minus the tone control circuit and we powered it up and it worked, but when I tried to wire up the tone control circuit was when I noticed there was a difference. The difference between the 6S-229 and the 6S-254 is in the tone control circuit; otherwise the two chassis are identical. Fortunately, John has the original Zenith manual and we were both glad he has it, because that told me where the mica capacitors went. With all new capacitors in the audio circuits, the tone control circuit wired up, it was time to try out the AF amplifier, again. We plugged it in, measured the voltages, which are now

lower and that is a good sign and then I put my finger on the high end of the volume control and we got that wonderful 60 Hz buzz and so we knew it was working.

The AVC and 2nd detector stage was next and this was when I discovered a missing resistor. John went through his resistors and we cherry picked a 390k resistor and put it in. We didn't do any further testing, but instead went onto the next stage.

The IF and converter stages were the next and the last stages to wire up. There were several bypass capacitors to put in and since the new replacement capacitors are so much smaller that the originals, it made it easier to put them in better spots under that chassis. We plugged it in and no reception. Why this was done I don't know, but someone put a wire from the mixer terminal to the oscillator terminal on the variable capacitor and upon removing that wire we did get a couple of stations, not loud and slightly distorted, but it was working. At this point I could tell John was real happy, but we had more work to do.

I decided that this set probably has twiddleittus and some of you are wondering, "What is twiddleittus?" Some people when they see a screw automatically think that it should be tightened down and the screws in IF transformers, trimmer capacitors on the variable capacitor and trimmer capacitors on the chassis are prime candidates for twiddleittus. Fortunately the IF transformer trimmers weren't tightened down like head-bolts on a car engine, but were way off. After aligning the IF's we picked up lots of stations and the distortion was gone, but the radio was somewhat dead at the top end of the dial, so I tried to tweak the antenna/mixer trimmer on the variable. This screw was tightened down like a head-bolt on a car engine and after getting it loose I was able to align the top end of the dial and what a difference that made. Now it sounds like a Zenith.

We tried the short-wave and we could get a few stations along with a buzzy dead carrier that would repeat every few MHz, so I started looking around at what could be causing the RFI and I saw an LED ceiling light on. Hey John, turn that LED light bulb off and he did and sure enough the interference was gone. I love the new LED bulbs and I have them all over my house and out in the garage, but some do generate RFI (radio frequency interference). It was 4 PM and time for me to go and I don't like to drive in the dark, especially when it was snowing, and while it wasn't a blizzard out there, it was still snowing. I left John with a working Zenith 6S-254 for him to finish up, double-check my soldering and touch up the short-wave alignment.

We talked a couple days later and he had been test running the Zenith and one evening he turned it on and it was dead. He checked it out and found no voltage on the plate of the 1st audio amplifier, which was caused by the 1st audio plate resistor opening up, but it was also intermittent. Sometimes it would work and sometimes it wouldn't so he had to change the plate resistor for the 6F5GT. Otherwise the Zenith 6S-254 is done. It only took me four hours to resurrect this radio and John probably has an hour into it, so it took about five hours to rebuild this radio. Not too bad I thought. Hopefully, this will give some of you the courage to resurrect your gutted radio.

(Bret's Old Radios, continued from page 19)

former. If you are not familiar with this technique, take a look at Ed Dupart's two articles in the last issue of the *Chronicle* (Fall 2018).

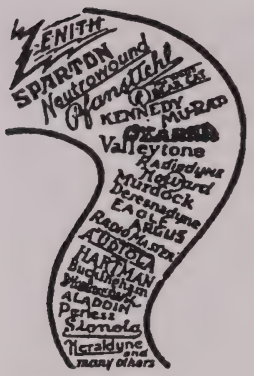
Now we get into the videos I was really looking forward to, the ones on cabinet repair. I can tell you right now that these are great. Volume 3, *Plastic Cabinet Repair & Refinishing*, contains the following chapters: Plastics Overview, Cleaning & Polishing, Sun Damage, Crack Repair, Using Body Filler, To Paint or Not, Priming & Painting, and Molding & Casting. Bret starts by describing the various plastics used in radio cabinets, and then gets into the techniques for repairing and refinishing them. As examples, he uses some cabinets that have been severely damaged and shows how to put them back together, adding material when pieces are missing. The results are beautiful. There is detailed information on all the materials used in the repair process. The best thing about the video format is actually seeing the techniques demonstrated.

The final volume in the series is *Wood Cabinet Repair & Refinishing*, which is just as informative as the one on plastic cabinets. Chapters include Before You Start, Making Structural Repairs, Veneer Repair, Grain Filling, Using Toned Lacquer, Blending Repairs to Original Finish, and Flawless Finishes. A lot of time in the video is devoted to working with lacquer finishes, which were frequently used on old radios. The other big topic is repairing and replacing veneer. Again, actually seeing the repair techniques is extremely helpful. One interesting attitude Bret expresses is that his goal is not to make a radio look like it just came out of the factory; rather, these are antiques and it is okay for them to look old. The object is to make them look very well preserved and cared for.

Finally, there is a fifth disk available that was not part of the original series. It is a recording of a presentation Bret made at a workshop hosted by the Antique Radio Club of Illinois, and the topic is radio alignment. It duplicates some of the information on Volume 2, though it goes into more detail and uses several different types of chassis as examples.

Overall, Bret has created a very useful set of instructional videos. Personally, I know I will be returning to the volumes on refinishing as a reference when I tackle my own basket cases. Are they a good value for the money? The way I look at it, it all depends on how much time you have available. Restoring old radios can be very time consuming. If you have little time, your best option might be to spend a lot more on a set that is fully restored. On the other hand, if you do have the time and enjoy working on these old sets, you can pick up what others might consider junk for a very low price and restore it into a beautiful collector's item. In this latter case, I would say the information on these videos is invaluable and a great bargain.

The promotion Bret was offering is long over, however, I contacted him and asked if he would give the discount to our members, and he indicated he would. For more information and pricing, send an email to Bret Menassa at bretsoldradios@att.net and mention that you are a MARC member and saw this in the Chronicle.



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Please note that ads for the Spring issue are due by March 1st.

REPAIR SERVICE: I repair all tube type radios. I have most parts and tubes in stock. Dan Schnaidt, 325 Milton Ave., Battle Creek, MI 49017, 269-282-1324 (home), 734-417-6995 (cell).

FOR SALE: ARBE-III, Universal Battery Eliminator, $159.95 + $15 S/H. Michigan residents, please add $9.00 sales tax. The ARBE-III is designed to provide the power requirements for most pre 1930's battery operated radios. The custom wound power transformer provides 3 electrically isolated supplies (A, B, C) which are all regulated and short circuit proof. Comes assembled, tested and with a full five year warranty. Please refer to our website at www.arbeiii.com for direct purchase using PayPal. You can contact me at 517-787-2985 for details on money order or personal check payments. We are also offering custom wound audio transformers for early radios. $19 each or $20 each for the center tapped version plus S/H. See our website for other items offered. You can reach me at arbeiii@yahoo.com.

FOR SALE: PARTS! We have a full stock of radio supplies, including capacitors, tubes, knobs (including our two types of real wood repros!) , bulbs, tube shields, etc. Our two specialties: repro radio dials (we bought the former Clint Blais repro dial business in 2003, and they are still the best!) and we can duplicate or repair most old volume or tone controls. Phono needles, carts and wheels too. Email any wants or see our website at www.oldradioparts.net Over 30 years servicing radios here! Mark Oppat mop-pat@comcast.net 253 Blanche St, Plymouth, MI 48170 734-455-4169 11am-9pm most days.

FOR SALE: Reproduction radio dial belts and dial cord to fit all radios. Bronze tuner cable for early RADIOLA models. Tuner repair kits for many ATWATER KENT radios. Complete details at www.Adamsradio.com. Adams Manufacturing Company, PO Box 1005, Lincoln Park MI 48146.

FOR SALE: 1% Precision tolerance 500V silver mica capacitors and **1% Precision** 630V tubular axial PSA polystyrene film capacitors. Also for sale are 1000 Volt silver mica capacitors available in many different pF sizes. All capacitors are new production. For price list and product info, please contact Dave Cantelon, 6 Ferncrest Gate, Scarborough, Ontario, Canada, M1W 1C2 ; phone 416-502-

9128; Email: justradios@yahoo.com or visit WebSite: www.justradios.com

FOR SALE: – Repro Antique Radio Dial Covers – Mark Palmquist - Retro Radio Repair www.dialcover.com 5033 Arbor Ln, Lilburn, GA 30047 (770) 923-8929 jmpalm@mindspring.com.

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FOR SALE: 1955 Lowery Double Key Board Electric Organ with beautiful Mahogany Cabinet, 55 tube unit, very powerful in its day, $400.00 selling as is. Variety of older ham tube equipment. Quite an assortment of ham magazines, 1970-1990s. Battery radios from 1920s, no horns but complete. Variety of transmitting tubes: 807, 866, 832, 815 etc. Portable Bakelite and wooden TVs early 1950s. WANTED: Kennedy console or table model radio. Can be rough needing work or restored if price is right. Phone Gary Clayton, The Olde Tyme Radio Centre, Belgrave, Ontario, Canada NOG 1E0, 519-357-4304, oldetymeradio@tnt21.com, http://www.oldtymeradio.ca/.

FINDER'S FEE: I am willing to pay a $100 finder's fee to the first person who can provide me the whereabouts of the Reuben Smith 5-tube TRF battery radio with a glass front panel (circa 1925) manufactured in Lansing, MI that I traded off to the late Oran Sauder of South Lyon, MI perhaps 25 or more years ago. Jim Clark, 517-648-2785 or jc072651@aol.com. Thank you.

FOR SALE: Over 50 radios FOR SALE. Sell one or all. Battery sets, Consoles, Table model wood and plastic, Transistors. Priced right. Also radio related misc. literature, test equipment and misc. ham radio accessories . Alan Reed, 2875 Geneva Hwy, Manitou Beach, MI 49253. 517-547-7470 evenings.

WANTED TO BUY: Your old capacitors, new or used (prefer with leads). All types: Wax, plastic, molded, striped, metal shell, disc, etc. These can be from your radio restorations, junk box, or vintage 1940-70s new old stock. Will pay shipping as well, or I can pick up in Kalamazoo at Expo 2017. Dan Gutowski 734-718-7450 email: dg16ms26@msn.com.

FOR SALE: My entire collection of radios. Please send a large S.A.S.E. to Robert Rossi, 10936 Melbourne Ave., Allen Park, MI 48101-1184, 313-386-8321.

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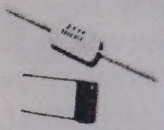

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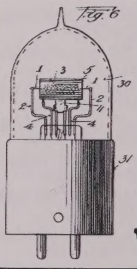

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Call for Articles

Your editor is always looking for new articles. Many of our readers have indicated a preference for articles related to collecting, as opposed to highly technical pieces. Of particular interest are personal accounts of a particular restoration you might have done, or historical accounts related to our hobby. But all subjects related to vintage electronics are welcome.

If you have an idea please feel free to discuss it with me, either by phone or email.

Steve Enzer, MARC Chronicle Editor, enzer@binsys.com. 517-592-2841

Paid Ads Accepted

The *Chronicle* accepts paid **business card sized ads**. The ad may be in the form of your business card, or other text/graphics of business-card size. All submissions must be camera-ready. We will not do any typesetting, but simply copy what you send us. Also, your ad can appear on the MARC website at no extra charge.

Rates: $10 per single issue, $35 per year (four issues).

Please send all submissions to:
Steve Enzer, MARC Chronicle Editor,
12740 Monroe Pike, Brooklyn, MI 49230
Enclose a check for correct amount payable to MARC.

Winter Meet January 26th in Farmington Hills

Vintage Electronics Expo Powered by MARC

Date: Saturday, January 26, 2019.

Location: Costick Activities Center, 28600 Eleven Mile Road, Farmington Hills, Michigan. Entry is at Gate 4, Door A.

Time: Setup starts at 7:30 AM for sellers. Also, Early Bird admission for buyers is at 7:30 AM. General admission is from 9 AM to 3 PM.

Admission Fees: $5.00 for general admission, $10 for Early Bird admission.

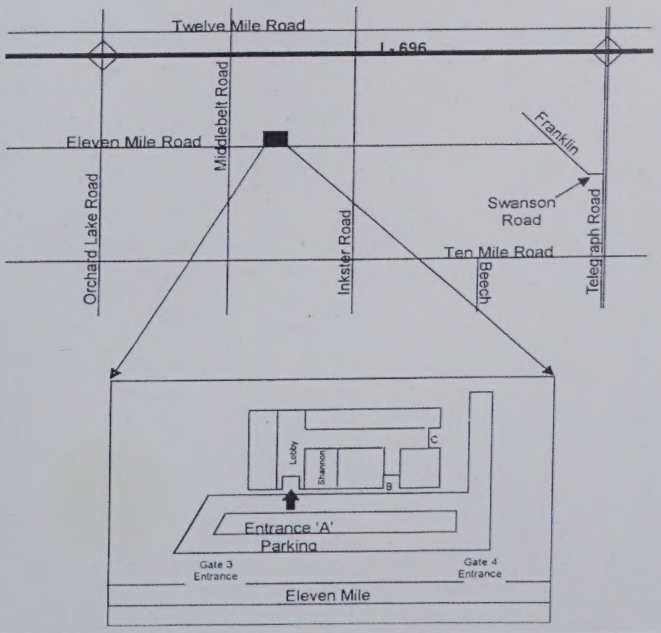
Activities: Flea Market, Equipment Contest, 50/50 Drawing, Seller's Drawing, Silent Auction, and Donation Auction, and special presentations.

Contest Categories:

All collectors have items that are special to them. We encourage you to show them off at our meets, and this the contest is the place.

- **Character Radios:** These are sets with a character theme, such as Mickey Mouse or Hopalong Cassidy.
- **Electronic Phonographs:** Any phonograph with a built in amp or radio will qualify.
- **The Open:** Any vintage electronic item including radios, televisions, test equipment, calculators, and games.

Host: Mike Dale. Please send table registration forms and fees to Mike at 3464 Judd Rd., Milan, MI 48160. You will receive a reservation confirmation. For information about the club or meet call Mark Oppat at 734-455-4169.



The Winter Vintage Electronics Expo

Saturday, January 26, 2019

THE place to find vintage radio and audio gear

See inside back cover for details

New this year for audio enthusiasts:

The Winter VEE Amplifier/Tuner Clinic

Jeff Hall of Muse Audio in Ann Arbor will be offering an amplifier and tuner clinic at the Winter Vintage Electronics Expo Saturday, January 26 at the Costick Center.

Jeff is an expert on stereo and mono audio gear and will have sophisticated test equipment on hand to check for distortion, power output and noise level as well as tuner sensitivity and other parameters. This is for either tube or transistor equipment and a print out of performance will be issued at the end of each unit tested. This service will run $20 per unit and will be split between the club and Jeff. This kind of test is hard to find today and would cost well over $50 at most any repair shop that could even do it today. Bring your audio gear and see how its performing!